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ENERGY
COMMISSION

DEMONSTRATION OF NEIGHBORHOOD ELECTRIC VEHICLES (NEVs)

CONSULTANT REPORT

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Gray Davis, *Governor*

CALIFORNIA ENERGY COMMISSION

Prepared By:
Arthur D. Little, Inc.
10061 Bubb Road
Cupertino Ca
Contract No. 500-00-002

Prepared For:

James M. Folkman
Contract Manager

David Ashuckian
Project Manager

Susan Brown
Manager
Transportation Technology Office

Nancy Deller
Deputy Director
Energy Technology Division

Steve Larson,
Executive Director

Demonstration of Neighborhood Electric Vehicles (NEVs)

Final Report

Notice:

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Special Note:
Ownership / Name Change to TIAX LLC from Arthur D. Little, Inc.
Effective April 5, 2002, the Technology and Innovation Practice of Arthur D. Little, Inc. (ADL) was purchased by TIAX LLC (TIAX). Thus, work performed by the prime contractor in this project was initiated under ADL and completed under TIAX. For simplicity, TIAX is referred to solely as the prime contractor in this report.

Report to:
California Energy Commission
1516 9th Street, MS 41
Sacramento, CA 95814-5512

July 1, 2002

Prepared by
Arthur D. Little, Inc.
10061 Bubb Road
Cupertino
California 95014
Tel 408 517-1550
Fax 408 517-1551

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Neighborhood Electric Vehicles (NEVs) are designed for low-speed, local trips in neighborhoods and urban areas, to run errands, commute to and from work or school, and to make small, local deliveries. NEVs are ideal candidates for a "shared-car use" or station car demonstration. The goal of this effort is to demonstrate how community layout and land use can maximize transportation efficiency through vehicle and technology choices.

The California Energy Commission (CEC) awarded grant funds to four NEV demonstration host sites: Anaheim Transportation Network (ATN), Anaheim; Salas O'Brien Engineering (SOBE), San Jose; Zapworld.com (ZAP), Sebastopol; and the City of Palm Springs (CPS). At each of these host sites, NEVs were demonstrated in various capacities, ranging from shuttling airport maintenance workers, to transporting community members on local errands. TIAX LLC conducted basic and applied research to improve the understanding of issues that may enhance or impede commercialization of NEVs, by analyzing qualitative and quantitative data generated by the host sites.

The host sites supplied TIAX with monthly totals of miles and days that the NEVs were driven. As illustrated in Figure ES-1, the NEVs displaced 22,494 miles and 6,281 days of use from conventionally fueled, internal combustion engine vehicles.

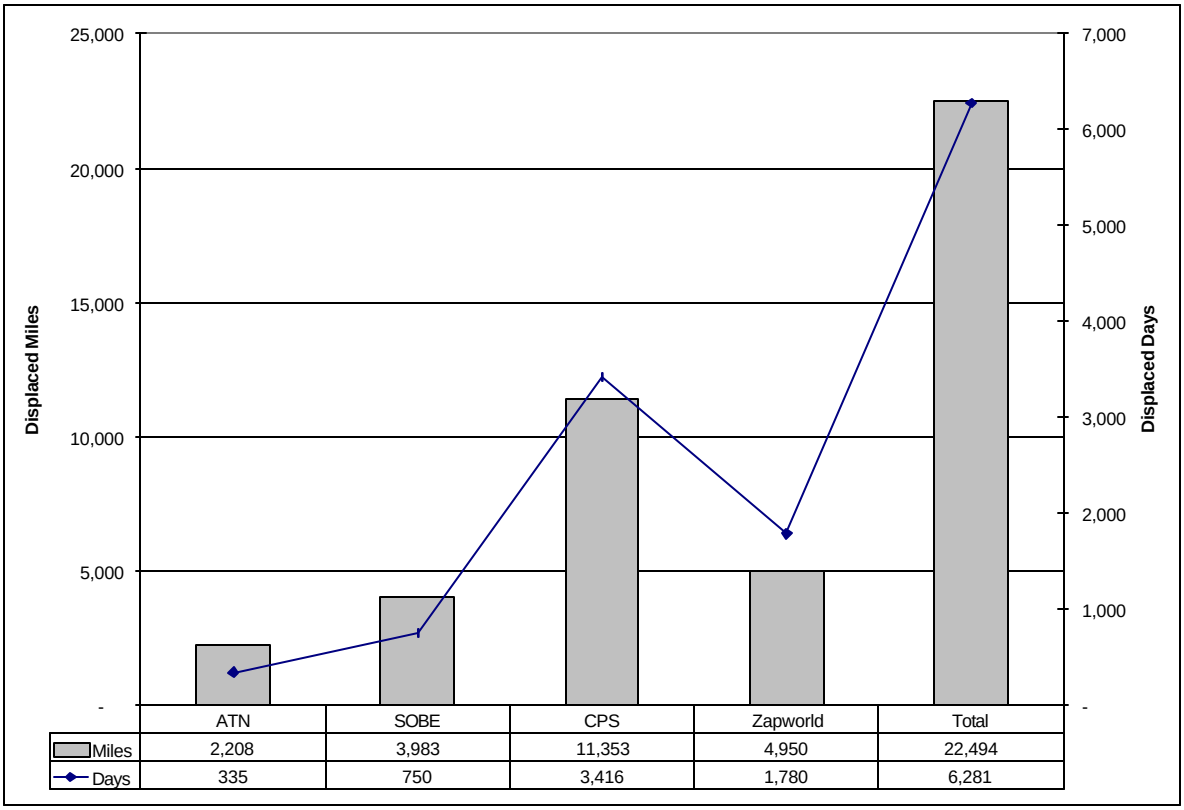


Figure ES-1. NEV Demonstration Program Accrued Miles and Days

In general, most participants who utilized the NEVs at the host sites supplied positive feedback, and offered some suggestions toward improved customer acceptance of the vehicles. This qualitative data was submitted by NEV Users at the CPS, SOBE, and ZAP host sites and is summarized in Table ES-1.

During the NEV Demonstration Program, quantitative data in the form of trip mileages and number of days/trips were collected by the host sites. At the start of the NEV Demonstration, TIAX provided each of the host sites with NEV Data Logs (Appendix E), with the intent of capturing data in the form of trips per day, miles per trip, reason for trip, etc. Unfortunately, the only host site to return data in this prescribed format was ATN. Consequently, some approximations were necessary on the part of TIAX, to fill some "gaps" in what was provided by the host sites.

Regardless, this data provides important points of assessment and comparison with regard to NEV utilization, petroleum-based fuel displacement, and overall cost differences between NEV usage and petroleum-based fuel vehicle usage.

To obtain a rough estimate of NEV "fuel economy", TIAX procured and placed an energy meter with the CPS and SOBE host sites. Mileage and associated required charge data was generated by the CPS participants, which allowed the calculation of an approximate NEV "fuel economy" of 0.223 kwh/mile.

Based upon estimated NEV "fuel economy" of 0.223 kwh/mile, and other host site specific values, a fuel cost per mile figure was estimated for each host site and in total. Each of the host sites were contacted and asked to provide their local cost of electricity in $/kWh. Table ES-2 presents the estimated energy usage in total, and the cost per mile with respect to energy only.

In the interest of providing a comparison of NEVs to conventionally fueled vehicles, their average fuel economy and average fuel price were evaluated. Average fuel economy for conventional vehicles was approximated as the CAFÉ standard for passenger cars (27.5 mpg). The average fuel price was approximated as the current average price for California gasoline as of June 17, 2002 ($1.563 per gallon). Figure ES-2 presents the comparison of fuel cost for NEVs and conventionally fueled vehicles on a per mile basis.

In general, the NEV Demonstration Program successfully achieved its objectives. The NEV concept was showcased to a broad range of public participants, who utilized the vehicles to accomplish a diverse range of tasks, displacing their usual use of internal combustion engine vehicles. Significant qualitative and customer acceptance data was generated, providing an indication as to the current positives associated with NEV use,

Table ES-1. NEV User Comments — Qualitative Data

Positive Comments	Suggested Improvements
• 30-mile range per charge always seemed sufficient to drivers • Most found 110-volt charging very convenient (esp. compared to full-size Electric Cars) • Since the NEV's can be charged by a simple 110 outlet, rather than any special charging system, the vehicles are easily charged at the solar charging site, the charging outlets specifically created, and multiple other locations throughout the City, such at the regular facility they are stored • A citizen who once owned a large manufacturer's vehicle, noted that the simple plug and onboard charging system was a big advantage over his special "inductive" charging system • Most liked easy access with open sides • GEM Shortbed NEVs seemed to be most practical single-choice NEV • Most drivers liked "quiet" motor, dependability and gas savings • Most found turning radius good with Shortbeds ande 2-Passenger NEVs • Drivers liked Clean-Air (Zero-Pollution) of NEV vs. conventional cars • Drivers liked size of Longbed for carrying bulky equipment and gear • Drivers liked faster speed, range and stable ride of NEVs compared to golf carts • Some liked Supercharger fast-charging capabilities (15 to 20 Minutes to charge) • Drivers liked comfortable seats in 4-Passenger NEVs • Drivers liked ease of parking and maneuverability of NEVs due to small size • Low purchase costs and low maintenance costs appealed to NEV purchasers • Most said lots of fun to drive, especially in getting good remarks from public while on the road! • Newer recent Private-Party and School District NEV purchasers were enthusiastic about their NEV purchases and their high initial mileages per day and month indicate dedication to the product (some in the 200 to 400 mile per month range).	• 25-mph top speed seemed slow to most after driving conventional cars (Slow speed not a problem with some on short commutes but 35 mph top speed preferred) • Many would like to see more roads to drive on (re. 35 mph limitation) • Some found ride too firm/bumpy (esp. Longbeds at dips) • A few would have felt more secure with doors of some kind • Most found turning radius insufficient with Longbeds and 4-Passenger NEVs • Drivers felt seats in the Utility NEVs were too upright • Some longer legged drivers needed more leg room in utility versions • Some remarked about lack of crash-protection (esp. from sides) • Some would like to see better bumpers front and rear • Solar charging on roof would be good feature • Adjustable steering wheel • Open sides windy, exposed to splashing • Some found it a challenge to stay out of way of faster traffic • Most did not like the side mirrors (too small and floppy) • Some would like to see short-bed attachment for 2 or 4-Passenger NEVs • Some would like to see Dump-Bed feature for Longbeds (Airport Grounds Crew — CPS) • Open sides to promote spontaneous, fun conversations with public • Better quality battery-charge indicator gauges

Table ES-2. NEV Energy Cost per Mile Calculations

Fleet	ATN	SOBE	CPS	ZAP	Total/ Average
Miles per Day	6.59	5.31	3.32	2.78	3.58
Energy price ($/kWh)	$0.09	$0.11	$0.15	$0.10	$0.114
Energy (kWh)	492.9	889.2	2,534.4	1,105.0	5,021.5
Cost per Mile:	$0.021	$0.025	$0.033	$0.022	$0.025

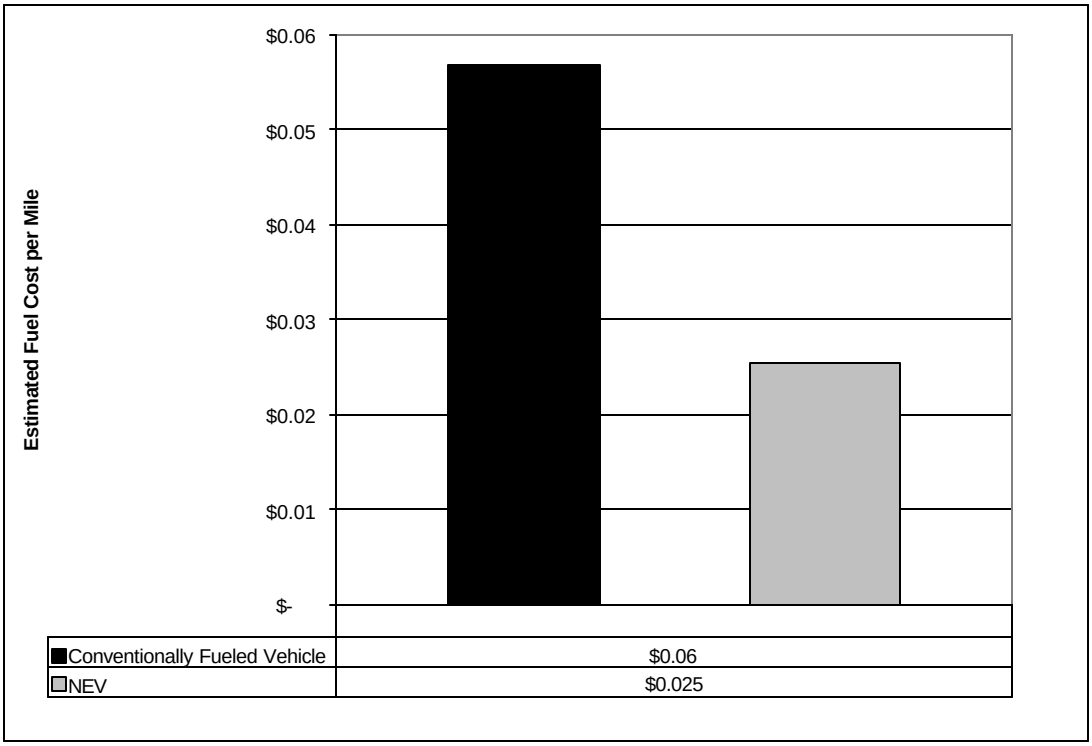


Figure ES-2. Fuel Cost per Mile Comparison

and what barriers may exist to deeper commercialization. Additionally, the NEV Demonstration Program displaced the following from internal combustion vehicles:

- 22,494 miles
- 6,281 days of use
- An estimated 7,537 trips and subsequent high emission cold starts
- An estimated 818 gallons of gasoline

NEV's proved over the course of the Demonstration that substantial financial savings could be realized in the form of reduced trip cost:

- TIAX estimates that based upon fuel efficiency and cost, the demonstrated NEVs cost $0.025/mile versus $0.06/mile for a conventionally fueled passenger car
- NEVs consumed approximately 5,021 kWh, for a total estimated cost of $635
- TIAX estimates that a conventionally fueled passenger car would have consumed approximately 818 gallons of gasoline, for a total estimated cost of $1,278
- NEVs realized a fuel savings of $643

1. Introduction

1.1 Project Background

It is well documented that cold-start emissions have significant impact on air quality. Due to cold-start fuel enrichment, subsequent quenching of hydrocarbons in a cold engine, and the delayed attainment of proper operating temperature of the catalytic converter, between 60 and 80% of the toxic air emissions from automobiles occur during this cold-start period. It has been estimated that the average trip length per vehicle per household is 9.1 miles[1]. Given this short average trip length, and the quantifiable problem presented by cold-start emissions, it is clear that alternative forms of transportation capable of short trips and lower emissions are a possible solution. Neighborhood Electric Vehicles (NEVs) are designed for low-speed, local trips in neighborhoods and urban areas, to run errands, commute to and from work or school, and to make small, local deliveries. NEVs are ideal candidates for a "shared-car use" or station car demonstration. The goal of this effort was to demonstrate how community layout and land use could maximize transportation efficiency through vehicle and technology choices.

The California Energy Commission (CEC) awarded grant funds to four NEV demonstration host sites: Anaheim Transportation Network (ATN), Anaheim; Salas O'Brien Engineering (SOBE), San Jose; Zapworld.com (ZAP), Sebastopol; and the City of Palm Springs (CPS). At each of these host sites, NEVs are being demonstrated in various capacities, ranging from shuttling airport maintenance workers, to transporting community members on local errands. Under contract to the CEC, TIAX engaged in basic and applied research to improve the understanding of issues that may enhance or impede commercialization of NEVs, by analyzing qualitative and quantitative data generated by the host sites.

This work authorization directed TIAX LLC (previously Arthur D. Little, Inc.) to provide technical support and data analysis on the NEV Demonstration Program. This work effort spans two technical support contracts, 500-98-002 and 500-00-002. Due to lack of data availability, no work was completed during the first phase of the work under contract 500-98-002. Therefore, all work was funded by this work authorization.

1.2 Project Scope and Objectives

Under the initial Work Authorization/Project Scope, TIAX was to perform the following four tasks:

Review of Proposals — Provide support as requested by CEC staff during the evaluation of proposals. This work shall include technical support on development of evaluation criteria and consistent scoring methods, and direct review and evaluation of the proposals. The contractor shall provide support, as requested during negotiations

[1] http://www-cta.ornl.gov/npts/1995/Doc/table8.pdf

with the participants, identifying the type and quality of data required from the participants.

Onsite Technical Support — Provide a minimal level of onsite technical support for the demonstration program. The primary duties for this task will include interaction with the participants during the data collection set-up phase of the project. The contractor shall ensure that data collection methods and procedures are sufficient to provide the types of data agreed upon between CEC and the participants. Review the results of initial data collection procedures to verify the proper functioning of these systems. Data must be supplied in Microsoft EXCEL spreadsheet format and be emailed directly from the participants to TIAX.

Data Analysis — Analyze the data supplied by the participants during the project. Data, which will be provided in electronic format, will be assessed to determine valuable figures of merit for the project. TIAX will identify any inconsistencies in the data (due to equipment failure, driver error, etc.), and notify CEC as well as the participants.

Final Report — The results of this study will be developed in a technical report, which discusses the data and draws conclusions, if any. Any confidential data received during the project will be averaged to disguise any individual participant or vehicle model, if possible. The report for this work authorization will be used for internal CEC purposes.

1.3 Description of Host Sites

1.3.1 Anaheim Transportation Network

The Anaheim Transportation Network (ATN), based in Anaheim, served as one of the NEV host sites. Under the supervision of the ATN, the NEV Demonstration Program was part of a larger effort to demonstrate the convenience of, and thereby institutionalize, clean transportation options for Anaheim. By involving the local community in the deployment of new transportation technologies, the program could foster other types of pollution sensitive behaviors and affect the transportation decisions of Anaheim residents, employees, and visitors.

In cooperation with the City of Anaheim's Community Development, Utilities, Police, and GIS departments, the ATN developed a program to introduce Neighborhood Electric Vehicles for a period of one year to three local communities.

Requirements for the communities to participate in the demonstration:

- Moderate to low income population
- Onsite property management staff
- Centralized location to access the vehicles
- Storage location

Three locations were selected in this process: Paseo Village Apartment complex, Park Vista Apartment complex, and Jeffery Lynn Apartment complex. These three projects fell under Anaheim's redevelopment program. Additional users of the NEVs included ATN staff, and staff from an independent local business called TreePower.

The demonstration took place with the (10) NEVs distributed between each of the participants. The NEVs utilized were Global Electric Motor Cars, LLC (GEM) E825 four-passenger models. Additional options deemed necessary for these vehicles were canvas and vinyl zip on door, and a Swivel Pack trunk unit. (See the front cover of this report for a picture of a GEM.)

Additional details on the specifics and experience gained by ATN during the NEV demonstration, is provided in a Final Administrative Report, submitted to CEC by ATN, and attached in Appendix A.

1.3.2 Salas O'Brien Engineering

The firm of Salas O'Brien Engineering (SOBE), located in San Jose, served as a host site and NEV use coordinator. Given their proximity to downtown San Jose, local college campuses, and residential neighborhoods, NEV offerings at this location sought to provide high profile replacement of conventional gas powered vehicles for short trips to and from:

- Downtown supermarkets, banks and other retail outlets
- Areas within the downtown environs
- San Jose Light Rail and main Amtrak station
- Local schools and libraries
- Theatre and other entertainment venues
- Other local errands

These NEVs were also targeted to displace long distance commuting for targeted commuters who would be able to use existing rail transit.

Additionally, the host site envisioned providing a wide cross-section of the population of San Jose the opportunity to see that NEVs are an excellent transportation option in the busy downtown district of San Jose. SOBE hoped to set the stage for continued local use of electric vehicles, to help protect the environment and jump-start the need for infrastructure – by providing high profile demonstrations of shared-use NEVs, and by initiating a network of charging stations throughout the downtown area.

SOBE utilized two GEM NEVs, a 2-passenger model and a 4-passenger model; as well as a single-passenger Corbin Motors Sparrow (Figure 1-1). The Sparrow is capable of speeds exceeding 35 mph, and therefore does not qualify as an NEV. However, grant funding was awarded for it's purchase, in the hope that it would offer the NEV users diversity and increased exposure to the concept of electric vehicles.

Figure 1-1. Corbin Motors Sparrow

Data collected for the Sparrow is presented in this report, but not emphasized, as the primary objective was evaluation of qualified NEVs.

Additional details on the specifics and experience gained by SOBE during the NEV demonstration, is provided in a Final Administrative Report, submitted to CEC by SOBE, and attached in Appendix B.

1.3.3 City of Palm Springs

The City of Palm Springs (CPS) sought to demonstrate the potential for NEVs to substitute for gasoline vehicle trips in a local municipality and other local public/private partnerships as workplace or private short-commutes.

CPS obtained funding for 21 GEM NEVs, with a wide range of models. In December 2000, CPS awarded an initial purchase contract for up to 17 GEM NEVs to Quality Car Co. of Midway City, Ca. (4 NEVs were kept in reserve if other manufacturers meet State NEV requirements in future). Initially only 10 of the 21 planned NEVs were acquired since some of the planned recipients (PS School District, Chamber of Commerce and others) had mid-year financial concerns and deferred purchases to a later date. In March, 2002 the remainder of the proposed Palm Springs NEV Fleet was acquired, due to continued efforts by Palm Springs to obtain a 21-Car NEV Fleet as originally intended in the grant application. Also due to a $2,000 per NEV rebate by GEM Co. to boost sales of NEVs in California (via a Jan. 1 through March 30, 2002 sales promotion by GEM, which included aggressive TV and printed media advertising). The $2,000 GEM Co. rebate, combined with the CEC Grant subsidy, provided Palm

Springs grant partners with a substantial $6,047.62 per NEV "discounted" price, which spurred sales of the final NEVs.

The multiple use groups, as well as the range of GEM NEV models employed in the CPS NEV Demonstration are presented in Table 1-1 and Table 1-2.

Table 1-1. City of Palm Springs NEVs — Group 1

User	NEV Designation	NEV Description
City of Palm Springs	Airport Grounds Maintenance Unit # 809	Green Longbed
	Airport Grounds Maintenance Unit # 813	Green Longbed
	City Hall General Purpose Unit # 000	Yellow 4-Passenger
	Fleet Maintenance Unit # 2909	Green Longbed
	Information Services/Print Shop Unit # 5909	Red Longbed
	Main Branch Library Unit # 6009	Blue 2-Passenger
	Procurement Department Unit # 4909	Red Shortbed
	Police Community Service Office Unit #8901	Blue Shortbed
Agua Caliente Band of Cahuilla Indians	SPA Hotel/Casino Unit # 2105	Green 4-Passenger
	A.C. Casino Unit # 2168	Green 4-Passenger

Table 1-2. City of Palm Springs NEVs — Group 2

User	NEV Purpose	NEV Description
Agua Caliente Band of Cahuilla Indians	SPA Hotel/Tribe Enviro Services	White Longbed
	SPA Hotel/Tribe Communications	White Longbed
	SPA Hotel/Tribe Security	White Shortbed
	Agua Caliente Casino Enviro. Services	White Longbed
Palm Springs Unified School District	Palm Springs High School Security/Maint.	Red Longbed
	Cathedral City High School Maintenance	Blue Longbed
	Desert Hot Springs High School Maint.	Yellow Longbed
	Chamber staff downtown PS commutes	Yellow Shortbed
Edward & Jeanette Zittel (Sahara Mobile Home Park)	Commuting about town replacing their auto	Green 2-passenger
George & Irene Gastelum (Single family homeowners)	Crossing guard commutes, errands, etc	Red Shortbed
Graham Young (Real Estate Agent)-	Commutes off duty from home to dog park, store, downtown	Yellow Shortbed
David Smith (Swim Pool Cleaner)	20 mile per day commutes (4 days/wk) doing PS pool route	White Longbed

In addition to the GEM NEVs, CPS obtained grant funding to purchase one Nissan Hypermini (Figure 1-2). The Hypermini is an electric car, capable of transporting 2 passengers at speeds exceeding 35 mph. Therefore it does not qualify as an NEV. However, grant funding was awarded for it's purchase, in the hope that it would offer the NEV users diversity and increased exposure to the concept of electric vehicles.

Figure 1-2. Nissan Hypermini

Data collected for the Hypermini is presented in this report, but not emphasized, as the primary objective was evaluation of qualified NEVs.

Additional details on the specifics and experience gained by the City of Palm Springs during the NEV demonstration, is provided in a Final Administrative Report, submitted to CEC by the City of Palm Springs, and attached in Appendix C.

1.3.4 Zapworld

The private business of Zapworld.com (ZAP), located in Sebastopol, received grant funding to participate in the NEV Demonstration Program. Staff turnover and company issues conspired to limit the usage of the NEVs.

The Vehicles were used enthusiastically by the City of Sebastopol. The City Planning Department, Fire Department, Public Works Department, and Parks Department used

the NEVs. The Park Department found the utility NEV especially useful. The City Manager noted that the NEV's were especially helpful for assisting managing their annual parade and Apple Blossom Festival, and as the EMT vehicle, due to it's maneuverability.

Due to prohibitive administrative, liability, and overhead costs, the taxi/rental NEV program could not be maintained. This vehicle was transferred to ZAP to shuttle packages back and forth between it's shipping and production facility. Although all the intended uses did not prove viable, overall the Project was considered a success. The City of Sebastopol continues to utilize the vehicles in their daily operations, and is looking for means to procure additional vehicles. ZAP continues to utilize its vehicles in its daily operations and is currently working with several NEV manufacturers to expand a sales distribution program throughout California and the United States, as well as create a Rental organization.

The first three vehicles were delivered to the City of Sebastopol in October 2000, and entered service by November, 2000. The remaining four NEVs were received in November 2000, and in full deployment by January 2001.

Additional details on the specifics and experience gained by ZAP during the NEV demonstration, is provided in a Final Administrative Report, submitted to CEC by ZAP, and attached in Appendix D.

2. Project Initiation and Logistics

2.1 Community Planning/Permitting

Most of the host sites did not report any significant challenges or problems obtaining NEV Demonstration approval from the community or local government. The fact that the GEM NEVs are street legal in zones of 35 mph or less, circumvented most potential questions from municipality police departments. ATN did experience a delay in initiating their NEV Demonstration, pending approval of local street maps and the proposed driving territory of the NEVs with the Anaheim Police Department. There was a learning curve within the Anaheim Police Department, as at least one officer did not initially realize that the NEVs were legal to drive on city streets, within the appropriate zones.

2.2 NEV and Driver Insurance

Each of the host sites had different experiences in obtaining insurance. Insurance is of critical concern to any shared vehicle endeavor, and presents it's own set of problems. The experiences of each host site are presented below, as excerpts from their respective Final Administrative Reports.

2.2.1 Anaheim Transportation Network

The ATN was fortunate to have a Station Car Program using electric vehicles in place at the time of deployment of the NEV demonstration project. Insurance was not easily obtained, however, and ATN's insurance carriers required contracts and guidelines signed and dated by each participant, including a current DMV report. This level of documentation provided enough data to underwrite the program. Premiums for the ten vehicles were $1100 per month with liability deductibles at $1000 per incident.

Individual files were produced for each participant that included an original signed and dated copy of program guidelines, driver agreement, DMV report, and copy of California Drivers license. Each participant received one on one instruction on the operation of the NEV by a member of the property management staff prior to operation of the vehicle and a map demonstrating streets with speed limits of 35 mph or less.

The ATN had no insurance claims during the demonstration.

After the September 11, 2001 event took place, the ATN was notified that the insurance carrier QBE Insurance Corporation would not be renewing upon its expiration. ATN's insurance broker Driver Alliance performed a nation wide search, once an extension request was denied. Six companies approached denied ATN's requests for coverage, three offered terms not acceptable to the ATN (please see attachment). The major issue was the shared use of the vehicle in a moderate to low income community. The community program was considered a "high risk" project making it impossible to insure.

ATN was advised by its insurance broker that if the "The NEV in Community" program was canceled and the vehicles were placed in storage, insurance coverage could be

obtained for the EV Station Car Program. Specialty National Insurance underwrote ATN's insurance coverage for a period of one year with an increased deductible. As a result of these insurance issues the decision was made to contact the communities and remove the NEVs from service. The insurance companies felt that even with the qualification process ATN had in place that there was not enough "control" over the use of the vehicles. This shared-use program was considered "high risk".

2.2.2 Salas O'Brien Engineering

Insurance was indeed a difficulty. SOBE's project was designed to allow as many participants as possible and this proved to be a major obstacle for the insurance companies.

Insurance companies classified SOBE's project under a "rental" category (whether the drivers were charged or not). Rental insurance rates are considerably higher than standard single-driver or family rates. SOBE's original budgetary proposal provided for an insurance expense of $6800. This was based on a preliminary quote received from SOBE's insurance broker of $460/6 month period for the GEMs. SOBE had anticipated that costs would be higher by the time the grant was approved and allowed for such in their original budget.

SOBE had been provided with information from Corbin-Pacific's web site that insurance for a one-passenger vehicle, in the motorcycle classification would be much less than for that of a typical passenger vehicle. While this information is true with regard to Personal Auto Insurance, it is not the case for Rental Auto Insurance. According to SOBE's broker, The Steve Peacock Insurance Agency, the reasoning was that people were more likely to be cavalier in the Sparrow, therefore; a "fun-factor" premium was added. The cost of insuring the Sparrow was not part of SOBE's original proposal.

SOBE's insurance carrier for Auto Coverage was Columbia Insurance Company of Omaha, Nebraska. SOBE had a maximum liability limitation of $1,000,000 with a $500 deductible for comprehensive liability and collision. At the end of our one-year policy period, Columbia Insurance Company notified SOBE that they were no longer offering (i.e., canceling) that insurance program. This action did not impart SOBE's program, as they were ending it anyway. Since the project was in the process of winding down, Carl and Marianne Salas of Salas O'Brien Engineers, Inc. began to insure the vehicles under their personal policy with Farmers Insurance. Farmer's Corporate Insurance premium would have been more expensive than the personal insurance premium shown in Table 2-1 below (and given that the demonstration was concluded, the number of drivers was restricted). While this insurance was not a part of the Demonstration, SOBE felt it would be useful information to include in their report.

Table 2-1. NEV Insurnace Premium Comparisons — SOBE

Vehicle	Budgeted Amount	Rental Premium for Demonstration	Current Annual Personal Premium
Sparrow		$3,247.00	$722.00
GEM 4		$2,496.00	$1,120.00
GEM 2		$2,455.00	$990.00
Total Insurance Costs	$6,800.00	$8,198.00	$2,832.00

Due to the enormous increase in insurance costs, SOBE was required to reduce the proposed number of vehicles from 5 to 3. A budget revision allowed SOBE to reduce the equipment budget in favor of increasing the insurance (other) budget to cover the additional expense.

No claims were submitted against any of the insurance policies. SOBE is unable to comment on this aspect of insurance coverage.

2.2.3 City of Palm Springs

The City of Palm Springs is Self-Insured and therefore does not pay a separate premium for NEV Insurance. The City therefore assumed all liability and loss risks for it's own NEV Fleet. During the 1-year demonstration program in Palm Springs, the City had minor vandal damage with (one) NEV, but no accidents, injuries or incident insurance claims to deal with during the 13-months of the program. Luke Air Force Base in Arizona, with their huge NEV Fleet, also did not have notable problems with insurance claims as well. The Palm Springs Unified School District is also self-insured, and had not encountered insurance problems. The local ACBCI Indian Tribe is insured by conventional insurance by local insurance agent Tom Kieley, who also acts as their Risk Manager. Mr. Kieley said the insurance rates for the Indian Tribe NEVs average the same costs as their standard vehicles. He said they did not have a historical cost for NEV claims since the NEVs are still a relatively new transportation concept.

According to Tom Zabriskie of Quality Car Co. (longest-term GEM dealer in California), it has been generally found that major recognized insurance companies (i.e., State Farm, Allstate, Farmers, etc.) will write lower-cost annual NEV premiums due their familiarity with the NEV type vehicles. Smaller insurance companies, who are generally not as familiar with the relatively new concept of NEVs, tend to write higher cost premiums to cover their lack of history for claims for a vehicle they are not familiar with. According to Mr. Zabriskie's customers, NEV Insurance Premiums average about $100 to $200 per year with a major insurance company, but could cost substantially more per year with smaller non-major insurance companies. Local NEV drivers Brook and Jeanette Zittel said their NEV premium costs $82 annually.

2.2.4 Zapworld

The Holiday Inn Express, which originally intended to loan or rent the vehicles to guests, faced a number of challenges in implementing their portion of the program. The vehicles were delivered, and a solar charging station was installed on the roof of the hotel. However, at that point, bureaucratic and legal concerns intervened, and prevented the use of the vehicles off hotel property.

In discussing this challenge with Holiday Inn staff who were involved in initial grant preparation, they expressed the opinion that the onsite manager of the specific hotel, although informed of the project during its inception, never fully bought into the program concept. This combined with 'roadblocks' thrown up by corporate legal team, concerns over liability, insurance costs, etc. The vehicle was transferred to the City.

3. Qualitative/Customer Acceptance Data

3.1 User Comments

An important objective for the NEV Demonstration was to obtain qualitative data, in the form of comments and criticisms made by NEV users. TIAX created a NEV User Survey form (Appendix E), to be completed by NEV users both before participating in the NEV Demonstration, and afterward. The Survey sought to capture positive and negative perceptions held by the public before using an NEV, and how their opinions may have changed afterward. Additionally, the NEV Demonstration allowed for the generation of important customer acceptance data by utilizing the equivalent of a focus group to identify barriers to commercialization.

No qualitative data was obtained in the form of “Before-Use” User Surveys. The City of Palm Springs and SOBE generated many helpful "After-Use” User Surveys, which captured many of the positive attributes of the NEVs, as well as some suggested improvements. In addition, several SOBE NEV Users submitted testimonials. All qualitative data and NEV User comments for each host site are included in their respective host site Final Administrative Reports, which can be found in Appendices A through D.

Table 3-1 summarizes many of the positive feedback and suggestions for improvement, as submitted by NEV Users at the City of Palm springs, SOBE, and ZAP host sites.

Table 3-1. NEV User Comments — Qualitative Data

Positive Comments	Suggested Improvements
• 30 Mile range per charge always seemed sufficient to drivers • Most found 110 Volt Charging very convenient (esp. compared to full-size Electric Cars) • Since the NEV's can be charged by a simple 110 outlet, rather than any special charging system, the vehicles are easily charged at the solar charging site, the charging outlets specifically created, and multiple other locations throughout the City, such at the regular facility they are stored. • A citizen who once owned a large manufacturer's vehicle, noted that the simple plug and onboard charging system was a big advantage over his special "inductive" charging system • Most liked easy access with open sides • GEM Shortbed NEVs seemed to be most practical single-choice NEV • Most drivers liked "quiet" motor, dependability and gas savings • Most found turning radius good with Shortbeds and 2-Passenger NEVs • Drivers liked Clean-Air (Zero-Pollution) of NEV vs. conventional cars • Drivers liked size of Longbed for carrying bulky equipment and gear • Drivers liked faster speed, range and stable ride of NEVs compared to golf carts • Some liked Supercharger fast-charging capabilities (15 to 20 Minutes to charge) • Drivers liked comfortable seats in 4-Passenger NEVs • Drivers liked ease of parking and maneuverability of NEVs due to small size • Low purchase costs and low maintenance costs appealed to NEV purchasers • Most said lots of fun to drive, especially in getting good remarks from public while on the road! • Newer recent Private-Party and School District NEV purchasers were enthusiastic about their NEV purchases and their high initial mileages per day and month indicate dedication to the product (some in the 200 to 400 mile per month range)	• 25 mph top speed seemed slow to most after driving conventional cars (Slow speed not a problem with some on short commutes but 35 mph top speed preferred) • Many would like to see more roads to drive on (re. 35 mph limitation) • Some found ride too firm/bumpy (esp. Longbeds at dips) • A few would have felt more secure with doors of some kind • Most found turning radius insufficient with Longbeds and 4-Passenger NEVs • Drivers felt seats in the Utility NEVs were too upright • Some longer legged drivers needed more leg room in utility versions • Some remarked about lack of crash-protection (esp. from sides) • Some would like to see better bumpers front and rear • Solar charging on roof would be good feature • Adjustable steering wheel • Open sides windy, exposed to splashing • Some found it a challenge to stay out of way of faster traffic • Most did not like the side mirrors (too small and floppy) • Some would like to see short-bed attachment for 2 or 4-Passenger NEVs • Some would like to see Dump-Bed feature for Longbeds (Airport Grounds Crew — CPS) • Open sides to promote spontaneous, fun conversations with public • Better quality battery-charge indicator gauges

4. Quantitative Data

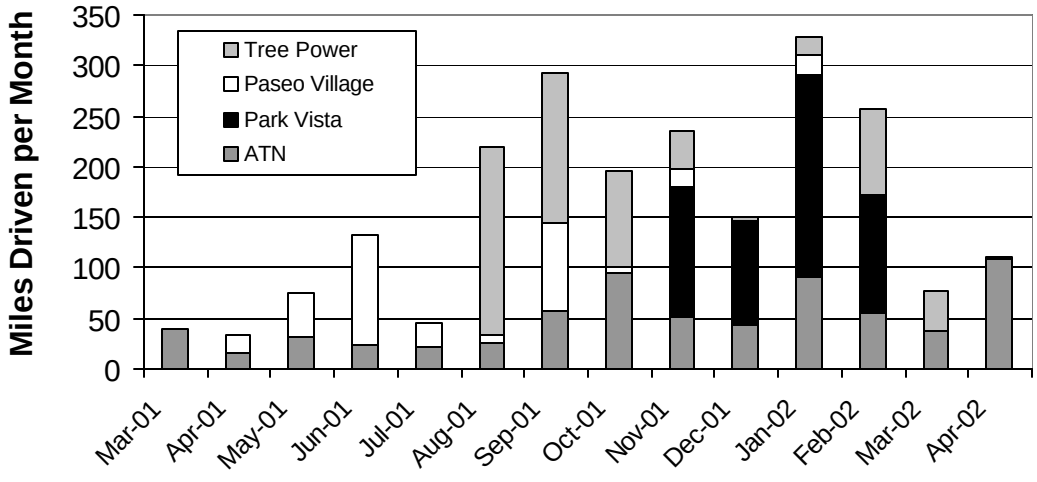
During the NEV Demonstration Program, quantitative data in the form of trip mileages and number of days/trips were collected by the host sites. At the start of the NEV Demonstration, TIAX provided each of the host sites with NEV Data Logs (Appendix E), with the intent of capturing data in the form of trips per day, miles per trip, reason for trip, etc. Unfortunately, the only host site to return data in this prescribed format was ATN. Consequently, some approximations were necessary on the part of TIAX, to fill some "gaps" in what was provided by the host sites.

Regardless, this data provides important points of assessment and comparison with regard to NEV utilization, petroleum-based fuel displacement, and overall cost differences between NEV usage and petroleum-based fuel vehicle usage.

4.1 Mileage Accrual and Days Driven

4.1.1 Anaheim Transportation Network

During the ATN NEV demonstration, ten 4-passenger GEMs were used. These ten NEVs were at times shared between different neighborhoods/communities, and at times dedicated to a specific group. Some of the neighborhoods became involved in the NEV Program later than others, impacting the monthly mileage totals, as presented in Figure 4-1 below.



	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02
Tree Power						186	149	38	3	19	85	40	2
Paseo Village		19	43	109	23	8	87	17	1	20			
Park Vista								129	103	200	117		
ATN	40	15	32	23	22	26	57	51	43	90	55	38	109

Figure 4-1. Miles Driven per Month — ATN Fleet

Factors such as weather did not seem to affect monthly mileage totals for the ATN fleet, as it did with other host sites in Northern California's slightly less favorable winter climate. It did appear that most user groups exhibited higher mileages early on in the demonstration, with interest levels and utilization gradually leveling off with time.

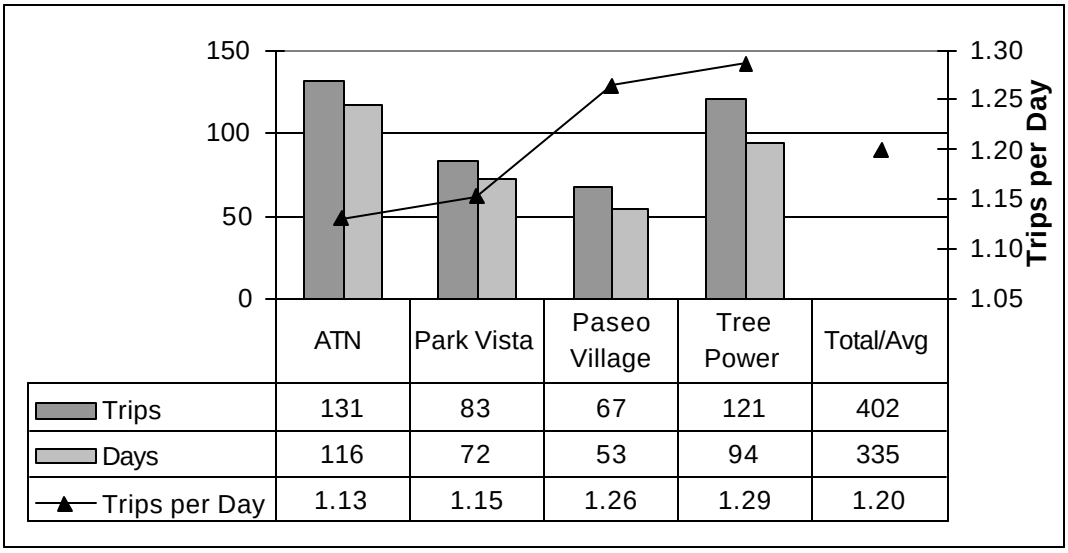
ATN was the only host site to report mileages by individual trip, as well as by daily total. The significance lies in that multiple daily NEV trips can potentially displace multiple cold starts by a conventional vehicle. For the sake of consistency, the host sites will be compared on the basis of miles, days, and miles per day. However, the ATN trend of multiple trips per day may be extended to the other host sites for approximate comparison. Figure 4-2 presents ATN's trip and day use frequency.

The ATN NEV Demonstration participants averaged 1.2 trips per day, and therefore more than one cold start per day was potentially avoided. Figure 4-3 compares the ATN participants according to mileage, days of use, trips, miles per day, and trips per day.

4.1.2 Salas O'Brien Engineering

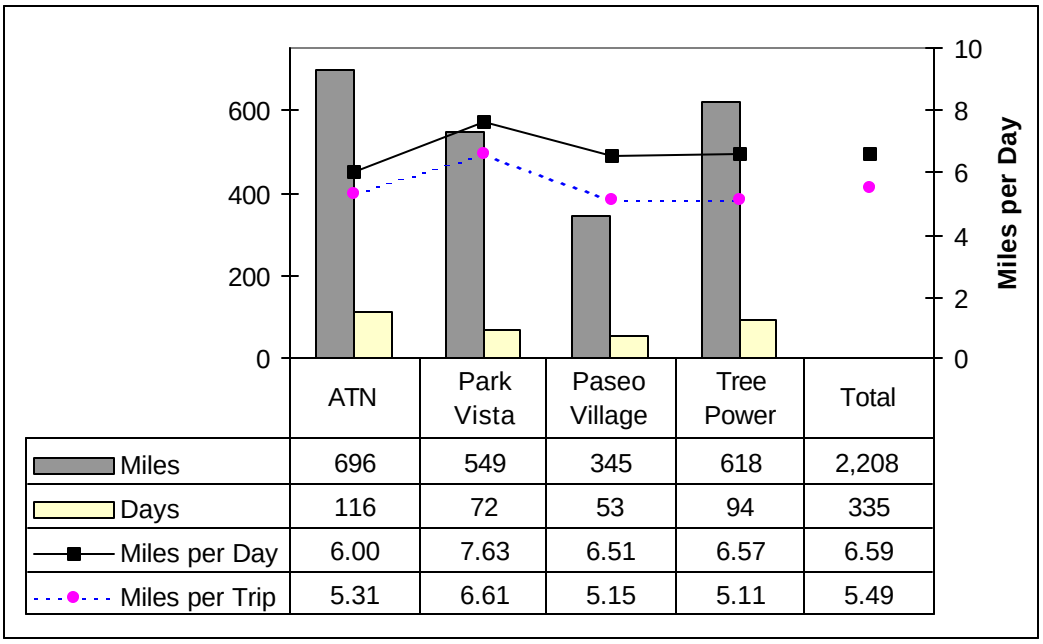
During the duration of the SOBE demonstration, three vehicles were utilized – a 4-passenger GEM (GEM 4), a 2-passenger GEM (GEM 2), and a Corbin Motors Sparrow (Sparrow). As described previously, these vehicles were signed out to participants, who included 16, 20, and 13 different drivers for the GEM 4, GEM2, and Sparrow respectively.

NEV Trip Logs, provided by TIAX, were typically used to record daily mileages, trip durations, and trip purposes. Monthly mileage tallies are presented in Figure 4-4, below.



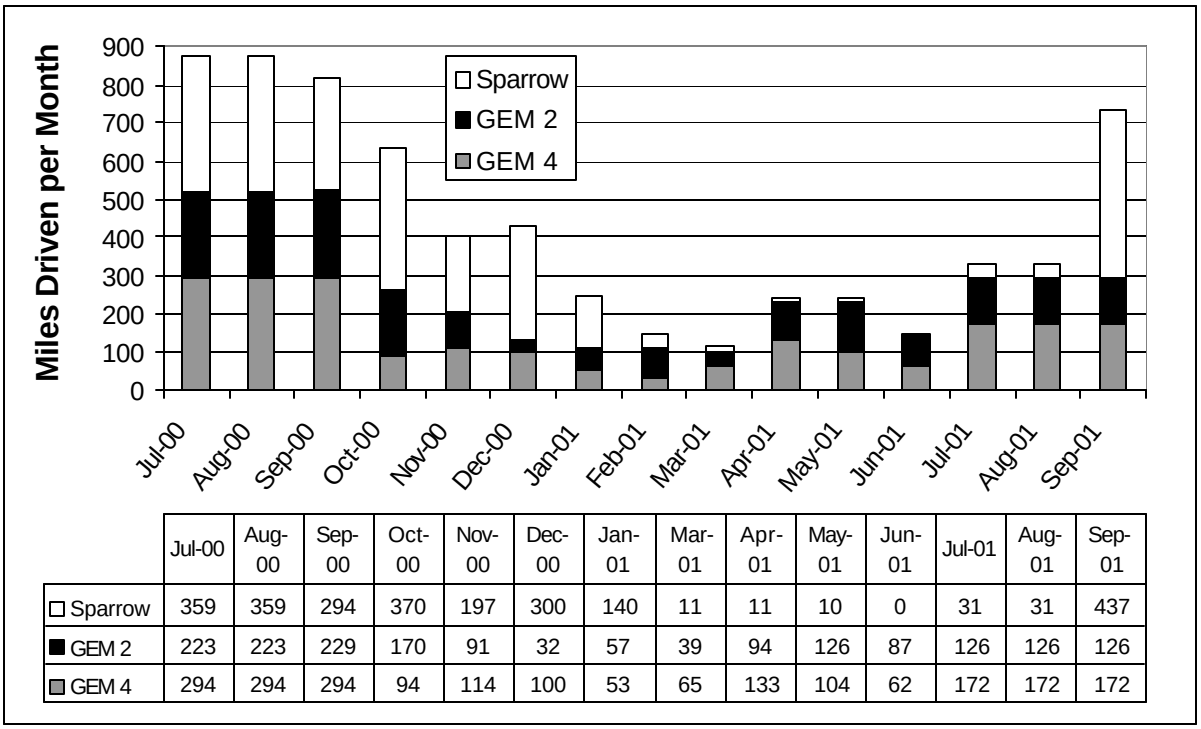
	ATN	Park Vista	Paseo Village	Tree Power	Total/Avg
Trips	131	83	67	121	402
Days	116	72	53	94	335
Trips per Day	1.13	1.15	1.26	1.29	1.20

Figure 4-2. ATN NEV Usage Frequency — Trips and Days



	ATN	Park Vista	Paseo Village	Tree Power	Total
Miles	696	549	345	618	2,208
Days	116	72	53	94	335
Miles per Day	6.00	7.63	6.51	6.57	6.59
Miles per Trip	5.31	6.61	6.15	5.11	5.49

Figure 4-3. Usage Comparison — ATN Host Sites

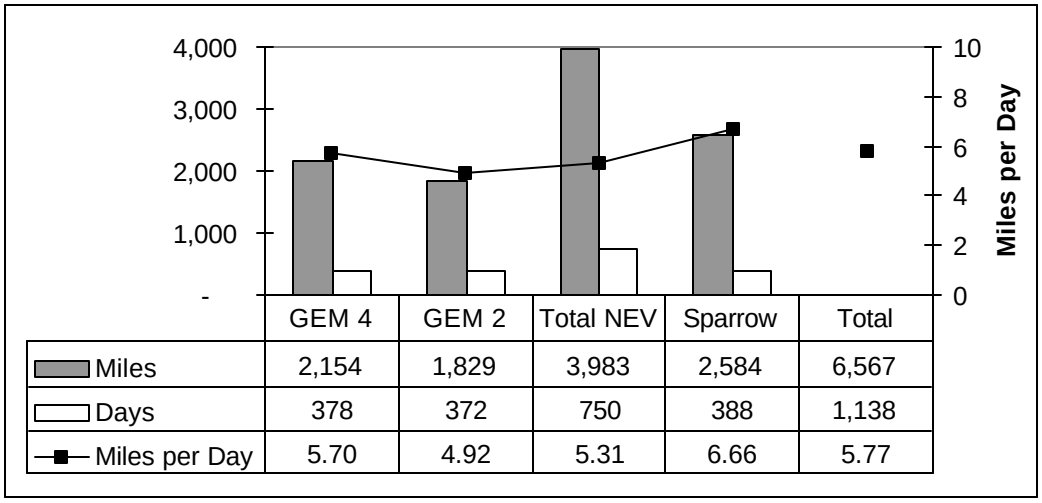


	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Jan-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01
Sparrow	359	359	294	370	197	300	140	11	11	10	0	31	31	437
GEM 2	223	223	229	170	91	32	57	39	94	126	87	126	126	126
GEM 4	294	294	294	94	114	100	53	65	133	104	62	172	172	172

Figure 4-4. Miles Driven per Month — SOBE Fleet

After exhibiting high utilization at the start of the demonstration, the GEMs and Sparrow received less use during the winter months, before recovering slightly the following summer. This trend for the GEMs is consistent with participant comments regarding weather-induced discomfort when travelling in the GEMs, and their unease with vehicle safety in inclement driving conditions. This trend for the Sparrow reflects similar participant concerns with regard to safety in inclement driving conditions, as well as the mechanical issues that took the Sparrow offline for a period of time.

As indicated in Figure 4-5 above, the GEMs and Sparrow were driven approximately the same number of days, but the Sparrow accumulated more miles. This is likely due not only to the increased range and maximum speed of the Sparrow, but it's higher popularity with the participants. The higher mileage accrual on the Sparrow translated to a higher miles/day figure, as compared to the GEMs. During the demonstration, the GEMs averaged 5.3 miles/day.



	GEM 4	GEM 2	Total NEV	Sparrow	Total
Miles	2,154	1,829	3,983	2,584	6,567
Days	378	372	750	388	1,138
Miles per Day	5.70	4.92	5.31	6.66	5.77

Figure 4-5. Usage Comparison — SOBE Fleet

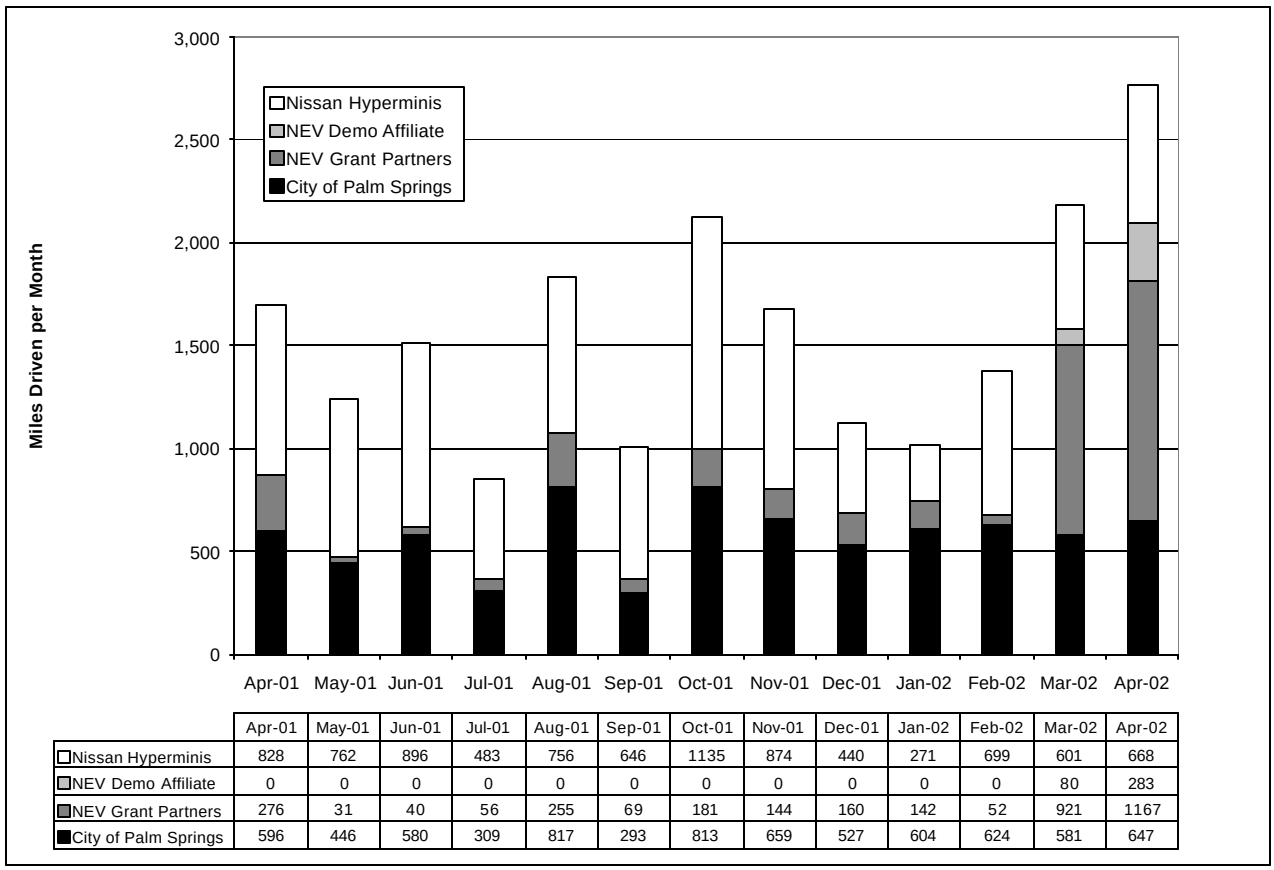
4.1.3 City of Palm Springs

Mileage and trip data collected by the CPS host site was segregated into several main groups, as illustrated in Table 4-1. Figures 4-6 and 4-7 summarize mileage and trip data according to these participant groups.

Due to their ability to travel on roads at higher speeds, and the inherent "fun-factor", the Hyperminis consistently received a high percentage of the total mileage. However, the NEVs utilized by the CPS logged substantial and consistent mileages throughout the demonstration. Due to a favorable climate, there was not seasonal fluctuation in mileage totals for the NEVs.

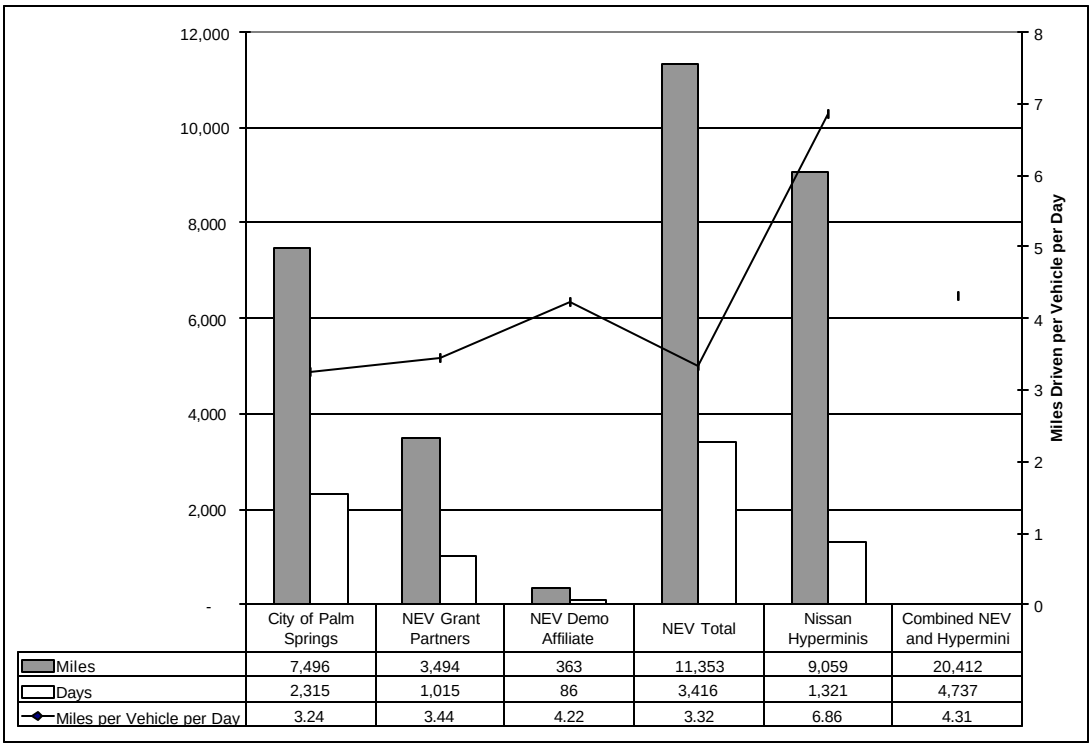
Table 4-1. CPS NEV Demonstration Group Participants

CPS NEV Demonstration Groups	Group Participants
City of Palm Springs	• Airport Maintenance • City Hall • CPS Fleet Maintenance • Library • Police Department • Procurement Department
Grant Partners	• Indian Tribe • Palm Springs School District • Zittel Family • Graham Young • Gastelum Family
Demonstration Affiliates	• David Smith – Swim Pool Cleaner
Hyperminis	• Various



	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02
Nissan Hyperminis	828	762	896	483	756	646	1135	874	440	271	699	601	668
NEV Demo Affiliate	0	0	0	0	0	0	0	0	0	0	0	80	283
NEV Grant Partners	276	31	40	56	255	69	181	144	160	142	52	921	1167
City of Palm Springs	596	446	580	309	817	293	813	659	527	604	624	581	647

Figure 4-6. Miles Driven per Month — CPS Fleets

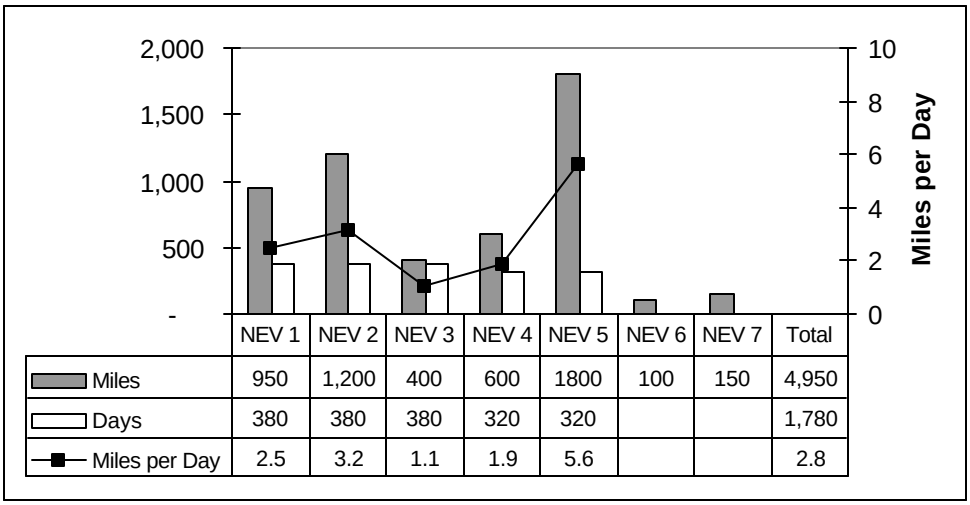


	City of Palm Springs	NEV Grant Partners	NEV Demo Affiliate	NEV Total	Nissan Hyperminis	Combined NEV and Hypermini
Miles	7,496	3,494	363	11,353	9,059	20,412
Days	2,315	1,015	86	3,416	1,321	4,737
Miles per Vehicle per Day	3.24	3.44	4.22	3.32	6.86	4.31

Figure 4-7. Usage Comparison — CPS Fleets

4.1.4 Zapworld

Mileage data compiled by ZAP was perceived to be approximated. No data was provided indicating the number of trips or days the NEVs were used, and therefore it was assumed that each vehicle was used once per day, five days per week, for each month there were reportedly in operation. The vehicles designated NEV 6 and NEV 7 were reportedly out of service for maintenance, and although nominal mileages were reported, no data reflecting the number of days or trips was received. Estimated usage for the ZAP fleet is shown in Figure 4-8.



	NEV 1	NEV 2	NEV 3	NEV 4	NEV 5	NEV 6	NEV 7	Total
Miles	950	1,200	400	600	1800	100	150	4,950
Days	380	380	380	320	320			1,780
Miles per Day	2.5	3.2	1.1	1.9	5.6			2.8

Figure 4-8. Estimated Usage Comparison — ZAP Fleet

4.2 NEV Charging

4.2.1 Experience and Problems

Generally, all of the NEVs were easy to charge due to the 110-Volt electrical systems in the GEMs (also found in most NEVs). In addition, 110-Volt outlets can be found at most workplaces or homes. In contrast, most full-size Electric Cars use 220 Volt charging systems, requiring expensive special chargers and expensive service runs to provide power to the chargers. In addition, the special 220V chargers severely limit where or how often conventional Electric Cars can be charged. This is not so with the NEVs. They can be readily charged almost anywhere with a household electrical outlet.

All host sites utilized residential charging techniques, with the exception of the Supercharger installed at the City of Palm Springs (seeFigure 4-9). On August 20, 2001 an ETEC (Electric Transportation Engineering Corp.) Supercharger was installed behind City Hall to "Fast-Charge" the City's NEV fleet vehicles in 15 to 20 minutes rather than 6 to 8 hours required for conventional 110 volt charging (Supercharger lease rate of $120/month was subsidized by Pinnacle West and ETEC of Phoenix, Arizona in an effort to promote the Fast-Charge concept in California). Special Supercharger electrical connectors were installed on the City's 8 NEVs, at no cost to City ($500 installation cost each, absorbed by GEM Co. and ETEC). This was the first municipal Supercharger installation in California; the two other superchargers are being used privately on International Airports for Electric Push-Outs and NEVs.

Figure 4-9. Long-bed Utility NEV at Supercharger Charge Station (Palm Springs, CA)

No charging problems were noted during the NEV Demonstration, with the slight exception the City of Palm Springs and the Indian Tribe encountering charging problems with the initial 10 NEVs purchased by the City & Tribe in early 2001. However, this vehicle-specific problem was solved by replacing their on-board chargers under GEM warranty, at no cost to the participants. No further charging problems were encountered with the newer GEMs purchased later in the program.

4.2.2 Charging Calculations

In late September to early October 2001, TIAX performed a datalogger analysis for NEV energy consumption. Craig Childers, California Air Resource Board (ARB), graciously loaned two energy meters, equipped with LCD kWh counters to the project. After determining which host sites were most favorable for placement of these energy meters, they were integrated into the data collection programs at the City of Palm Springs and SOBE. The personnel were trained on their use and recording of data. The objective of this analysis was to quantify the energy required by the NEVs on a per mile basis – the equivalent of fuel economy in conventional vehicles. Although no meaningful data was captured at the SOBE host site, a small dataset was generated at the City of Palm Springs.

Table 4-2 presents the City of Palm Springs charging data and estimated kWh/mile required by the GEM NEV. The data reflects seven days of use. Raw kWh were recorded from the energy meter LCD readout, and adjusted to account for an estimated 85% efficiency rating of the charging assembly.

Table 4-2. NEV Charging Calculations

Miles	Raw kWh	Estimated kWh	Estimated kWh/mile	Equivalent mpg
38	9.98	8.48	0.223	150

This estimated energy requirement is utilized in costing calculations in Section 4.5.2.

4.3 Maintenance Requirements

Generally, the GEM NEVs in the program were low maintenance, and the host sites reported few problems. There were however, two notable exceptions.

ZAP reported that they experienced several mechanical failures with their NEVs. However, they did not provide any documentation on these failures.

The most significant mechanical problem was experienced by CPS and prompted a recall and replacement of their on-board chargers, due to a charger failure encountered in most GEMs manufactured in late 2000 and early 2001. All of the defective chargers (in 10 City & Indian Tribe initial NEVs) were replaced within a short time after failure by GEM, under warranty and at no cost. Other GEMs acquired after the initial acquisitions in early 2001 did not encounter charger problems.

The host site that best exemplified proper and proactive maintenance practices was CPS. As noted in the City's Final Administrative Report (Appendix C):

The City has it's own Vehicle Fleet Maintenance Department (City maintains over 250 Fleet Vehicles, having it's own Fire, Police, Airport and General Units). The City therefore maintained their NEV Fleet in-house, which was also the case with the Agua Caliente Indian Tribe and Palm Springs Unified School District NEV vehicles. Keeping battery fluid levels up is probably the most important routine maintenance feature for NEVs, or any other battery powered vehicle. (GEM NEVs have six 12 Volt Deep-Cell, RV Type Batteries- 72 Volts per vehicle).

Battery Maintenance was highly stressed as well by Richard Eaton, NEV Fleet Maintenance Supervisor for Luke Air Force Base (nearly 400 electric vehicles on base). He said that "Batteries, properly maintained, will last about 3 Years in an NEV. Batteries with low electrolyte (fluid) levels, not kept up to full, tend to last only about 1-Year". At about ($70 to $90 per battery), annual battery replacement costs can be expensive. The City had one (high Supercharger-use 4- Passenger NEV), that required early battery replacement, and we suspect that we didn't check the battery fluids in that one enough. None of the other NEVs in the Palm Springs area NEV Fleet required battery replacement during the program.

It is recommended to follow the example by Luke Air Force Base and establish a mandatory Quarterly NEV Maintenance Schedule for all NEVs, but also suggest Monthly Servicing of Battery Systems, especially to top off battery fluid (electrolyte) levels. This policy can triple the life of the NEV batteries.

Minor problems, as well as the recall and replacement of on-board charger assemblies for the City of Palm Springs, were effectively handled by GEM. If a problem was encountered, the GEM factory always corrected the problem under the GEM 12-month warranty, at no cost to the participants.

4.4 Conventional Vehicle Mileage/Trips Displacement

It can be assumed that all of the trips and mileage accrued by the NEVs displaced the use of conventional vehicles. There was considerable variability between the host sites with regard to NEV application and utilization. Several examples of tasks for which the NEVs were applied are listed in Table 4-3 below.

Based upon mileage and days/trips data recorded by the host sites, it is possible to estimate the mileage and number of trips and potential cold-starts, which were displaced from conventionally fueled vehicles. This is an approximation, given that some host sites only recorded total daily miles, regardless of the number of trips in a given day.

As indicated in Figure 4-10, a total of 22,494 miles were displaced over 6,281 days. If one assumes that ATN's documented 1.2 trips per day applies to the other host sites, potentially 7,537 internal combustion engine high-emissions cold-starts were eliminated by NEVs in this program.

Table 4-3. Examples of NEV Usage by Host Site

NEV Host Site	Examples of NEV Applications Which Displaced Conventional Vehicle Use
ATN	• Democratic convention several people drove around convention center • Shopping at markets • Pick up/drop off children at school • Home Depot for supplies • Post office • Show apartments to prospects • Lunch • Bank • Doctor appointment • Pickup film • Various errands
SOBE	• Shopping at markets • Pick up/drop off children at school • Post office • Lunch • Bank • Various errands
CPS	• Shopping at markets • Pick up/drop off children at school • Post office • Lunch • Bank • Various errands • Transportation of CPS maintenance employees • Transportation of airport employees
ZAP	• Various errands by City of Sebastopol Planning, Fire, Public Work, and Park Departments • Assisted management of City of Sebastopol's annual parade and Apple Blossom Festival • Parade EMT vehicle • Taxi/rental

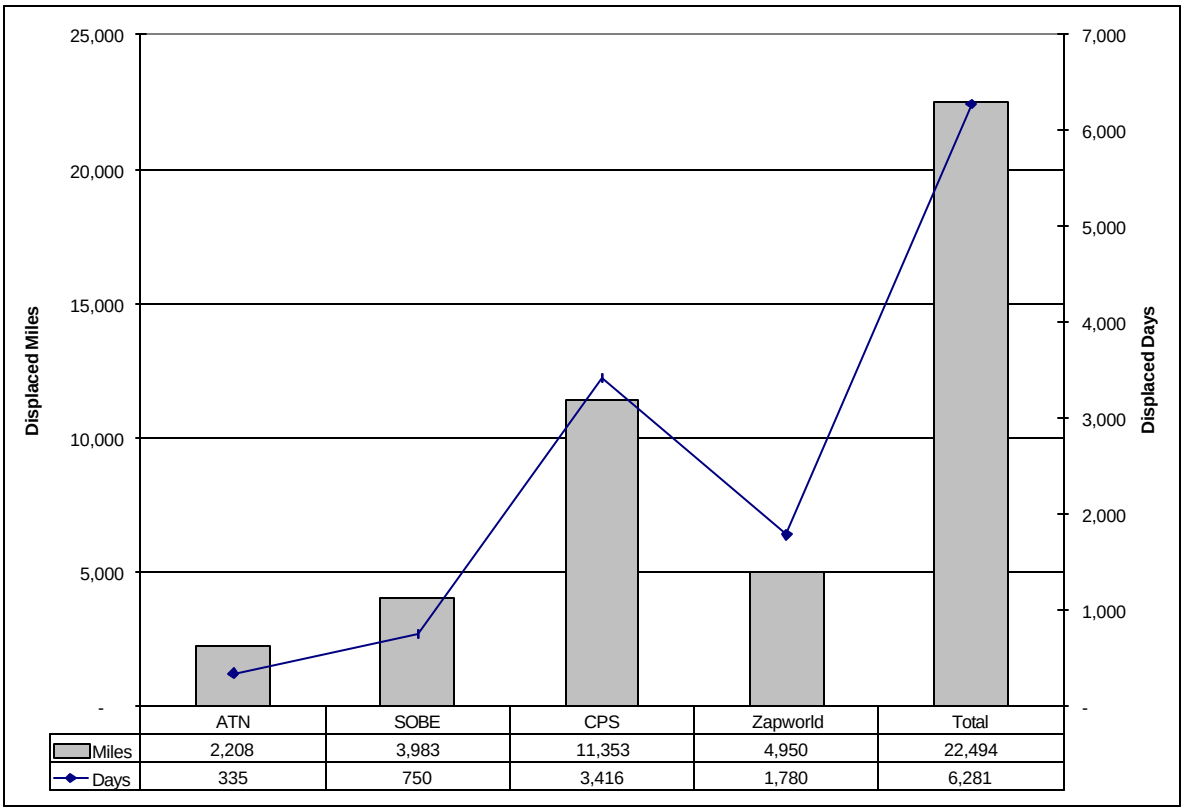


Figure 4-10. Displaced Miles and Days

4.5 Costs

4.5.1 Maintenance Costs

Based upon the input received by TIAX from the host sites, all NEV maintenance issues were resolved through the manufacturer, and covered under the 12-month warranty. Therefore, no maintenance costs directly impacted the host sites, to be analyzed on a cost per mile basis.

4.5.2 Charge Costs

Based upon estimated NEV "fuel economy" of 0.223 kwh/mile, and other host site specific values, a fuel cost per mile figure was estimated for each host site and in total. Each of the host sites were contacted and asked to provide their local cost of electricity in $/kWh. Table 4-4 presents the estimated energy usage in total, and the cost per mile with respect to energy only.

Table 4-4. NEV Energy Cost per Mile Calculations

Fleet	ATN	SOBE	CPS	ZAP	Total/ Average
Miles per Day	6.59	5.31	3.32	2.78	3.58
Energy price ($/kWh)	$0.09	$0.11	$0.15	$0.10	$0.114
Energy (kWh)	492.9	889.2	2,534.4	1,105.0	5,021.5
Cost per Mile:	$0.021	$0.025	$0.033	$0.022	$0.025

To compare NEVs to conventionally fueled vehicles, their average fuel economy and average fuel price were evaluated. Average fuel economy for conventional vehicles was approximated as the CAFE standard for passenger cars (27.5 mpg). The average fuel price was approximated as the current average price for California gasoline as of June 17, 2002 ($1.563 per gallon). Figure 4-11 presents the comparison of fuel cost for NEVs and conventionally fueled vehicles on a per mile basis.

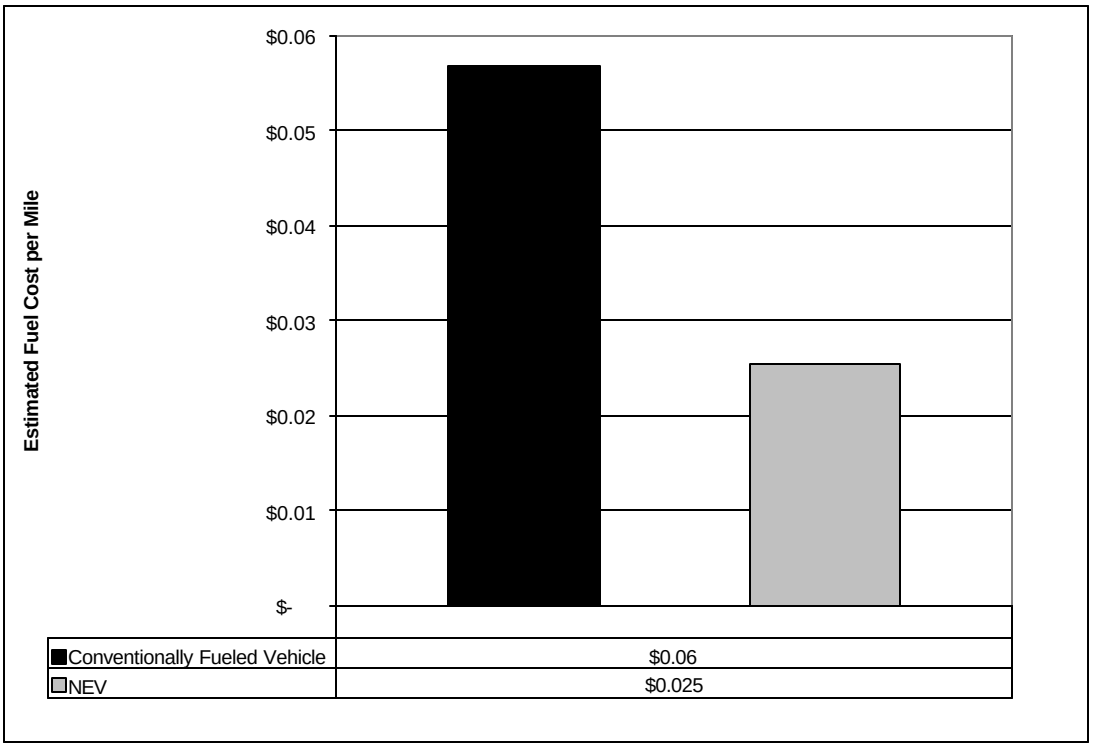


Figure 4-11. Fuel Cost per Mile Comparison

5. Conclusions and Lessons Learned

The NEV Demonstration Program proved to be a success on several intended fronts, and generated valuable figures of merit from several additional activities.

Despite several initial logistical delays, all host sites were able to acquire their vehicles and transition their participants into consistent usage patterns. Reaching a wide range of participants, and subjecting the NEVs to a broad spectrum of applications, allowed for the capture of comprehensive qualitative and quantitative data.

The vast majority of NEV participants, although some initially skeptical, came to understand and appreciate the utility, flexibility, and many advantages held by NEVs. Many became involved in the demonstration without recognizing that the slower speed and open sides were not meant to directly compete with the high speed and more protective conventionally fueled vehicles that they were used to. This demonstration allowed for participants to recognize and understand the advantages of NEVs, and perhaps form positive opinions to share with others. Many participants may have underestimated the number of short local trips that they make on a daily basis, and been intrigued by the NEV option. Additionally, the use of such a focus group, to identify potential room for improvement and barriers to more significant commercialization, is important in it's own right.

Several important lessons were learned:

- Finding covered or secure storage areas is important to deter vandalism
- The variety of NEV models that are available (long/shortbed utility models, 2/4 passenger models), increases their attractiveness to those who may have perceived them as one-dimensional due to their slow speeds
- Future efforts may involve more than one NEV manufacturer, as others begin to market NEVs to compete with GEM
- NEVs have the potential to attract considerable attention from local to international media. CPS suggested that additional funding be considered in future demonstrations, to account for coordinating press conferences and other events to further NEV penetration

The NEV Demonstration Program displaced the following from internal combustion vehicles:

- 22,494 miles
- 6,281 days of use
- An estimated 7,537 trips and subsequent high emission cold starts
- An estimated 818 gallons of gasoline

NEV's proved over the course of the Demonstration that substantial financial savings could be realized in the form of reduced trip cost:

- TIAX estimates that based upon fuel efficiency and cost, the demonstrated NEVs cost $0.025/mile versus $0.06/mile for a conventionally fueled passenger car
- NEVs consumed approximately 5,021 kWh, for a total estimated cost of $635
- TIAX estimates that a conventionally fueled passenger car would have consumed approximately 818 gallons of gasoline, for a total estimated cost of $1,278
- NEVs realized a fuel savings of $643

In support of the concept that many people simply need exposure to the NEV concept to understand the advantages and utility, note the following instance that occurred during the NEV demonstration in Palm Springs:

David Smith (a local pool cleaner) discovered the NEV concept while observing the City Hall NEVs. He requested, and was granted permission to borrow a City longbed NEV to try out on his pool route. He later purchased his own NEV using only the $2,000 GEM Rebate.